CENTER FOR BEAM PHYSICS SEMINAR

"Development of a 40MHz Gas Ionization Detector for Optimization of Luminosity in the LHC"

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Abstract:

A fast, radiation-hard, pressurized, multi-gap ionization chamber interfaced to a low noise charge-sensitive preamplifier is being developed for use in optimizing the luminosity of the LHC. These detectors are to be installed in the zero-degree neutral-particle absorber, and in the front quadrupole absorber of insertion regions 1 and 5. They are to be used in a feedback system with orbit correctors to keep the beams in optimum collision conditions. Such a system provides many interesting challenges in ionization chamber design and in the application of low noise fast electronics. Developmental devices have been tested in the SPS H4 beamline using single 300-450 GeV protons to simulate hadron showers produced by collision products of pp interactions in the LHC. The data provide convincing evidence that the luminosity of the LHC can be measured on a bunch-by-bunch basis at 40MHz over the entire range of luminosity envisioned for the LHC. The design principles, simulations and experimental results will be described.